THE TEMPERATURE STABILITY OF QUATERNARY PRECIPITATIONS REMANENCE

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The value and direction of the ancient magnetic field as well as physico-chemical conditions of rock formation play a great role in those natural rocks where the iron compound formation is important.

To reveal the conditions determining the specific character of the Quaternary precipitation remanence of the Yenisey River, their magnetic and structural properties were investigated. The value of the alternating magnetic field, which half reduces the remanence of the samples, makes up 16 kA/m, the coercive force is 30 A/m and the saturation magnetization is more than 800 A/m. Samples contain C, Si, Al, Mg, Na, Ca, K, Fe, O, H, bearing minerals: muscovite, clinochlore, riebeckite, ankerite, albite, orthoclase, magnetite, hematite. Kaolinite content does not exceed 2%.

As an additional damaging factor, heating of the samples was used. The relative magnetization (I/I_0) and the relative resistivity (ρ/ρ_0) of the samples at different temperatures are shown in Table 1.

Magnetic separation method was used to reveal the minerals to three fractions: strongly magnetic (1), weakly magnetic (2) and non-magnetic (3) (Table 2).

One can see from Table 2 that the basic ferruginous mineral in the fraction (1) is magnetite. Hematite is probably located on the surface of magnetite grains. The isomer shifts testify different surrounding of radiating and absorbing nucleus and to different iron ion valency. The magnetic minerals of the fraction (2) are hematite grains. The compounds FeOOH and FeO do not give any contribution into the remanence. The isomer shift and the quadrupole splitting of these compounds are identical with those for the weakly magnetic fraction.

For the Fe nucleus in magnetite (fraction 1) the value of the isomer shift in octahedral location is 0.525 mm/sec. The effective magnetic field, which is on the Fe nucleus is $3.9 \cdot 10^4$ kA/m. And in tetrahedron location they make up 0.925 mm/sec and $3.8 \cdot 10^4$ kA/m respectively. With the rise of the temperature, the reflex intensity of Fe_3O_4 decreases to the temperature of 300°C. Then one can observe its increase (35°/2θ) to temperature 580°C. The magnetization carriers in fraction 2 are Fe_2O_3. The values of the isomer shift make up 0.424 mm/sec, and that of the effective magnetic field is $4.1 \cdot 10^4$ kA/m. The isomer shift values and the quadrupole splitting values for FeO are 0.672 mm/sec and 0.505 mm/sec, and for FeOOH, these values make up 1.434 mm/sec and 2.525 mm/sec, respectively.

Thus, the Mössbauer spectra make it possible to determine the types of magnetic minerals in complex compounds. Their identification enables to reveal the stability of remanence in geological time scales.

Table 1. *Relative magnetization and relative resistivity at different temperatures.*

°C	20	50	100	150	200	250	300	350	400	450	500	550	595
I/I_0	1	0.87	0.85	0.86	0.99	0.99	0.87	0.96	0.93	0.93	0.75	0.70	0
ρ/ρ_0	20	0.20	0.07	0.53	0.53	0.09	0.09	0.09	–	–	–	–	–

Table 2. *Mineralogical composition of different fractions.*

Fraction	Percentage			
	Fe_3O_4	Fe_2O_3	FeO	FeOOH
1	87.3 ± 0.2	0.7 ± 0.7	4.7 ± 0.3	8.0 ± 0.2
2	–	21.7 ± 0.7	36.4 ± 0.1	42.3 ± 0.2
3	–	–	53.1± 0.05	46.9 ± 0.05